

CLAIMS

What is claimed is:

5 1. An apparatus for preventing data loss in a network device receiving at least one network data connection, the network device including a framer, a pointer interpreter, a demapper, and a phase locked loop (PLL), the PLL providing a PLL control word indicative of the PLL recovered data rate of the PLL, the
10 network data connection carrying a plurality of data messages having a first format, the first format including a portion of the data providing indicia of the existence of an error condition, the plurality of data messages having an input data rate, the apparatus comprising:

15 a monitor for detecting an error condition, the monitor configured and arranged that in the event an error condition is detected, the monitor is responsive to the detected error condition by providing as an output an error signal;

20 a protection device including an error data generator and an error data rate generator, the error data rate generator coupled to the PLL, the error data rate generator configured and arranged to receive the PLL control word, the data rate generator responsive to the PLL control word by providing a carrier signal for a data rate substantially equal to the PLL recovered data
25 rate, the error data generator coupled to the monitor and being responsive to the error signal by generating a plurality of predetermined error data, wherein the error data rate generator is coupled to the data generator and in conjunction therewith provide as an output, the plurality of predetermined error data at the
30 PLL recovered data rate; and

the plurality of predetermined error data provided to the network device wherein the network device inserts the plurality of

predetermined error data into the plurality of data messages at the appropriate locations.

2. The apparatus of claim 1 wherein the monitor is configured and arranged to detect an alarm indicator signal in a SONET/SDH message.

3. The apparatus of claim 1 wherein data rate generator is a phase locked loop.

4. The apparatus of claim 1 wherein the data rate generator is an analog oscillator.

5. The apparatus of claim 1 wherein the PLL data rate signal is a digital control word in a digital format.

6. The apparatus of claim 5 wherein the data rate generator is a digital oscillator responsive to the digital control word and providing a error data rate substantially equal to the input data rate indicated by the digital control word.

7. The apparatus of claim 1 wherein the error condition detected by the monitor is a loss of signal error.

8. The apparatus of claim 1 wherein the error condition detected by the monitor is a loss of clock signal error.

9. The apparatus of claim 1 wherein the error condition detected by the monitor is a loss of frame signal error.

10. The apparatus of claim 1 wherein the error condition detected by the monitor are the portion of the data providing indicia of the existence of an error condition.

11. The apparatus of claim 10 wherein the portion of the data providing indicia of the existence of an error condition indicates an AIS error has occurred upstream in the data network.

12. The apparatus of claim 1 wherein the PLL control word is a previously stored PLL control word

13. An apparatus for preventing data loss among a plurality of network devices, each of the plurality of network devices including a framer, a pointer interpreter, a demapper, and a phase locked loop (PLL), each of the plurality of network devices receiving at least one of a plurality of network data connections, each of the plurality of network data connections carrying a plurality of data messages each of the plurality of data messages being in a first format and having a portion of data providing indicia of an error occurring, each framer receiving the plurality of data messages and providing gapped data to the pointer interpreter that provides gapped data to the demapper that removes the incoming data from each of the plurality of data messages, the demapper providing demapped gapped data to the PLL that provides an output of ungapped data, each PLL further providing a control word indicative of the PLL recovered data rate, the apparatus comprising:

a first switching module coupled to the plurality of network data connections, the first switching module monitoring the data messages and detecting an error condition, the first switching module providing indicia of the error condition, the first switching module configured and arranged to provide an error signal in the event that the monitored predetermined parts of a data message indicates an error has occurred;

a control word module coupled to the phase locked loop of each of the plurality of network devices to monitor a control word providing indicia of the input data rate of the plurality of data messages received by the corresponding network device and the control word module further coupled to the first switching module and the control word module configured and arranged to provide as an output the control word of one of the plurality of network devices identified as receiving a network data connection identified as having an error condition;

a protection device including an error data generator and an error data rate generator, the error data rate generator coupled to the control word module, the error data rate generator configured and arranged to receive the control word and to provide a data carrier signal to provide a data rate substantially equal to the PLL recovered data rate of the corresponding network device, the error data generator coupled to the switching module and being responsive to the error signal by generating error data, wherein the error data generator in conjunction with the error data rate generator provide as an output, the plurality of predetermined error data at substantially the PLL recovered data rate;

the plurality of predetermined error data at substantially the PLL recovered data rate provided to the network device to be appropriately inserted into the plurality of data messages on the identified data network connection.

14. The apparatus of claim 13 wherein the error condition detected by the monitor is a loss of signal error.

15. The apparatus of claim 13 wherein the error condition detected by the monitor is a loss of clock signal error.

16. The apparatus of claim 13 wherein the error condition detected by the monitor is a loss of frame signal error.

17. The apparatus of claim 13 wherein the error condition detected by the monitor are the portion of the data providing indicia of the existence of an error condition.

18. The apparatus of claim 17 wherein the portion of the data providing indicia of the existence of an error condition indicates an AIS error has occurred upstream in the data network.

19. The apparatus of claim 13 wherein the control word is a previously stored control word.

20. An apparatus for preventing data loss among a plurality of network devices, each of the plurality of network devices including a framer, a pointer interpreter, and a phase locked loop (PLL), each of the plurality of network devices receiving at least one of a plurality of network data connections, each of the plurality of network data connections carrying a plurality of data messages each of the plurality of data messages being in a first format and having a portion of data providing indicia of an error occurring, each framer receiving the plurality of data messages and providing gapped data to the pointer interpreter that provides gapped data to the PLL that provides an output of ungapped data, each PLL further providing a control word indicative of the PLL recovered data rate, the apparatus comprising:

a first switching module coupled to the plurality of network data connections, the first switching module configured and arranged to monitor the incoming data messages for an error condition and in the event of an error condition being detected,

to provide an error signal including indicia of the detected error condition;

5 a control word module coupled to the phase locked loop of each of the plurality of network devices to monitor a control word providing indicia of the input data rate of the plurality of data messages received by the corresponding network device and the control word module further coupled to the first switching module and the control word module configured and arranged to provide as an output the control word of one of the plurality of network devices identified as receiving a network data connection identified as having an error condition;

10 a protection device including an error data generator and an error data rate generator, the error data rate generator coupled to the control word module, the error data rate generator configured and arranged to receive the control word and to provide a data carrier signal for to provide a data rate substantially equal to the PLL recovered data rate of the corresponding network device, the error data generator coupled to the first switching module and being responsive to the error signal by generating error data, wherein the error data generator in conjunction with the error data rate generator provide as an output, the plurality of predetermined error data at substantially the PLL recovered data rate;

25 the protection device further including a protection device framer, pointer interpreter, a mapper and PLL coupled to the error data rate generator, wherein in the event that an error condition has been detected, the first switching module is configured and arranged to provide the plurality of data messages carried on the identified data network connection to the protection device framer for processing, wherein the protection device framer receiving the plurality of data messages and providing gapped data to the protection device pointer interpreter that provides gapped data to

the protection device PLL that provides an output of ungapped data at the network device PLL recovered data rate;

the plurality of predetermined error data at substantially the PLL recovered data rate provided to the network device to be appropriately inserted into the plurality of data messages.

21. The apparatus of claim 20 wherein the error condition detected by the monitor is a loss of signal error.

22. The apparatus of claim 20 wherein the error condition detected by the monitor is a loss of clock signal error.

23. The apparatus of claim 20 wherein the error condition detected by the monitor is a loss of frame signal error.

24. The apparatus of claim 20 wherein the error condition detected by the monitor are the portion of the data providing indicia of the existence of an error condition.

25. The apparatus of claim 24 wherein the portion of the data providing indicia of the existence of an error condition indicates an AIS error has occurred upstream in the data network.

26. The apparatus of claim 20 wherein the control word is a previously stored control word

27. A method for maintaining a data rate in a desynchronizer, the method comprising the steps of:

receiving an input data signal;

recovering a first data rate of the input data signal;

detecting an error condition in the input data signal;

generating an AIS data rate signal substantially equal to the first data rate; and

generating a predetermined AIS characteristic data sequence at the AIS data rate such that the AIS characteristic data has a data rate substantially equivalent to the first data rate.

28. The method of claim 27 wherein the error condition detected by the monitor is a loss of signal error.

29. The method of claim 27 wherein the error condition detected by the monitor is a loss of clock signal error.

30. The method of claim 27 wherein the error condition detected by the monitor is a loss of frame signal error.

31. The method of claim 27 wherein the error condition detected by the monitor are the portion of the data providing indicia of the existence of an error condition.

32. The method of claim 31 wherein the portion of the data providing indicia of the existence of an error condition indicates an AIS error has occurred upstream in the data network.